

1. A method of fabricating a component having improved properties,
2 comprising the steps of:

- a) providing a substrate having a surface; and
- 4 b) depositing a layer of a material onto at least a portion of the surface of the
substrate using a laser-assisted direct metal deposition process, wherein, compared to the
6 substrate, the layer of material exhibits:
 - improved resistance to wear, corrosion, or oxidation,
 - 8 improved thermal conduction,
 - greater density, or
 - 10 a different phase.

2. The method of claim 1, wherein the material of the layer is specifically
2 chosen to promote a phase which is different from that of the substrate.

3. The method of claim 1, further including the step of using non-equilibrium
2 synthesis to dissolve a low-solubility material into the layer of material to increase its
hardness.

4. The method of claim 1, wherein the step of providing a substrate having a
2 surface includes the step of using direct metal deposition to build the substrate on an
incremental basis.

5. The method of claim 1, wherein the substrate and layer comprise a die,
2 mold or other tool.

6. The method of claim 1, further including the step of applying the layer of
2 material using a robotic, closed-loop DMD arrangement.

7. A method of fabricating a component having improved properties,
2 comprising the steps of:

4 a) providing a computer-aided design (CAD) description of the component to
be fabricated;
6 b) using a laser-assisted, direct metal deposition (DMD) process in
accordance with the CAD description to substantially fabricate the component having an
outer surface; and
8 c) depositing a layer of a material having a desired characteristic onto at least
a portion of the surface of the component, also using a laser-assisted direct metal
10 deposition process.

8. The method of claim 7, wherein the layer of material exhibits improved
2 wear resistance relative to the component.

9. The method of claim 7, wherein the layer of material is more thermally
2 conductive than the component itself.

10. The method of claim 7, wherein the layer of material is more thermally
2 conductive than the component itself.

11. The method of claim 7, wherein the layer of material has a density greater
2 than that of the component itself.

12. The method of claim 7, wherein the layer of material is more resistant to
2 corrosion than the component itself.

13. The method of claim 7, wherein the layer of material is more resistant to
2 oxidation than the component itself.

14. The method of claim 7, wherein the layer of material has a phase which is
2 different from that of the component itself.

15. The method of claim 14, further including the step of choosing the
2 material of the layer to promote a phase which is different from that of the substrate.

16. The method of claim 7, further including the step of using non-equilibrium
2 synthesis to dissolve low a solubility material into the layer of material to increase
hardness.

17. The method of claim 7, wherein the component is a die, mold or other
2 tool.

18. The method of claim 7, further including the step of applying the layer of
2 material using a robotic closed-loop DMD arrangement.

19. The method of claim 7, further including the step of incorporating one or
2 more conformal cooling channels within the component during its fabrication.

20. The method of claim 7, further including the step of incorporating one or
2 more conductive heat sinks or thermal barriers during its fabrication.